

Running Head: IMPLEMENTATION OF ELECTRONIC PATIENT CARE REPORTING

A plan for implementing an electronic Patient Care Reporting system

In Howard County Fire and Rescue

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### **Certification Statement**

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### **Abstract**

The problem was that Howard County Fire and Rescue (HCFR) had identified a need to implement an electronic patient care reporting system for documentation of EMS incidents. Unfortunately, HCFR had not created a plan for implementing an electronic patient care reporting (ePCR) system. This need to implement a system combined with available funding led HCFR to conduct the research necessary to select an ePCR system and create an implementation plan. The purpose was to select an ePCR system and create an implementation plan. The research questions answered were: What ePCR system will meet the needs of HCFR EMS providers and Quality Managers? What would be the benefits of an ePCR system? What should be considered when implementing an electronic patient care reporting system? What would be the plan for implementing an electronic patient care reporting system? The procedures utilized for this research project included literature review, interviews with subject matter experts, surveys of agencies currently using ePCR systems, and HCFR personnel. Action research was used throughout the project to create a plan for implementation of the system. Upon completion of this research project it was determined that Howard County Fire and Rescue should begin the implementation of the selected ePCR system.

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## **A plan for implementing an electronic Patient Care Reporting system**

### **Introduction**

The problem is that Howard County Fire and Rescue (HCFR) has identified a need to implement an electronic patient care reporting system for documentation of EMS incidents. The purpose is to select an ePCR system and create an implementation plan. Howard County Fire and Rescue operates an Advanced and Basic Life Support EMS Service. This service provides EMS response, triage, care, and transport for citizens and visitors to the County. The emergency medical services are financed via the County-regulated fire tax (Howard County Annual Budget Document 2005, p.76-78). Howard County Fire and Rescue employs a deputy chief, a medical director, and six field EMS supervisors (Medical Duty Officers) who are responsible for the field operations of the EMS section. This group, here forth referred to as quality managers, use information gathered from hand written medical incident records completed by HCFR paramedics. These records are used by the quality managers to gather data that can be used for future department planning and needs evaluation. Unfortunately, the use of hand-written medical records is not conducive with accurate data collection. This existing system compromises HCFR's ability to assess needs and accurately plan for the future. HCFR has identified the need to implement an electronic patient care reporting (ePCR) system that can be used to generate medical incident records, create accurate response data and minimize the need for redundant information collection. Unfortunately, HCFR does not have a plan in place to implement a system that would meet these needs.

This research project creates a plan for implementing an electronic patient care reporting system that will improve the quality of data gathered while decreasing the workload of the quality managers. This plan will include identifying an appropriate ePCR system, selecting

necessary hardware to operate the system, creating a plan for training personnel in the use of the ePCR system and measuring the success of the system as compared to the identified quality indicators.

This research project uses the action of research method to create a plan to implement an ePCR system that would improve EMS data gathering and decrease the workload of quality managers.

The research questions to be answered are:

1. What field ePCR system will meet the needs of HCFR EMS providers and Quality managers?
2. What would be the benefits of an electronic patient care reporting system?
3. What should be considered when implementing an electronic patient care reporting system?
4. What would be the plan for implementing an electronic patient care reporting system?

### **Background and Significance**

HCFR provides Fire and EMS services to the citizens of Howard County, Maryland. All EMS care provided by the department is documented on a paper-based Medical Incident Report (MIR). These MIR's do not include adequate and specific patient information or detailed information regarding EMS care provided. Data gathered from this system is then scanned, and a digital image is made of each paper document. This data base is expected to be used to address various types of EMS risks and responses throughout the County. HCFR does not consistently use this data to measure performance or plan for future department development.

Additionally, the paper-based MIR system requires a workforce of six non-uniformed employees to sort, scan, collate, and document the records. This arrangement is continuously

being scrutinized, as it may not be a fiscally sound use of human resources. The state of Maryland has made significant attempts to gather quality data regarding EMS patients. These attempts were supported with various grants and programs to both healthcare facilities and EMS organizations within the state. The data collected in this system was known to be inaccurate as fields had not been consistently defined. There are various patient reporting systems within the state, varying from jurisdiction to jurisdiction, making consistency a major challenge.

In August of 2003 HCFR implemented an Advanced Life Support (ALS)-based EMS system (Howard County Annual Report 2005, p.32-38). The operational planning for this service was based upon estimation of population growth and an increasing call volume. This service has grown in annual responses. Unfortunately, the methods for collecting patient care data and managing such data continue to be ineffective. Currently, a patient is treated and transported to the hospital by HCFR personnel. These personnel then complete a handwritten Medical Incident Report (MIR) that is used to document the patient's identification, assessment, diagnosis, medical interventions, and transport plan. A copy of this MIR is left at the hospital for the hospital's patient records. These records are then routed from the fire stations, to the Medical Duty Officer (MDO) who reviews the documents for accuracy and quality of care. After this review they are forwarded to the Quality Assurance clerk who gathers data from the record and inputs it into a QA database system. This data input includes patient identification, assessment, diagnosis and intervention. After the data input is completed, the records are forwarded to department headquarters for the EMS Chief and Medical Director to review sentinel events and do data analysis. However before that is accomplished, the MIR verifies scan the records onto a secure server that allows for secure storage and retrieval if necessary.

This system, as it exists today, has several problems including incomplete information fields, illegible writing, and diagnosis that are not consistent with the protocols established by the Maryland Institute of EMS Systems (MIEMSS). Additional challenges are then discovered during the quality review process as data is not accurate, the process is cumbersome, problematic, and reports cannot be generated to provide an accurate picture of the overall services being provided. The QA clerk is required to take the information from the medical record and input it into the QA system. This input requires a level of accuracy that is challenged by the problems identified earlier. The QA clerk and the Medical Duty Officers frequently have to contact EMS providers to get more specific or accurate information to complete the reporting process. HCFR EMS personnel work twenty-four hour shifts making it difficult to contact the employee for additional information when those employees are off-duty. These delays result in a delay in the patient reporting. The volume of EMS responses has increased each year (Howard County Annual Report 2005, p.16-23). As this volume increase has occurred that inefficiencies of HCFR's patient reporting methods have reached a point that a system improvement must be made.

Failure to make improvements in the area of patient care reporting will ultimately lead to system failure. This lack of accurate data will continue to compromise the Department's ability to collect necessary data for ongoing EMS system analysis. The lack of data compromises the Department's ability to plan for future expansion and staffing. Improvements in care provided by EMS providers and patients will not be measured and the effects of change will be unknown. The education and quality improvement programs will continue to be guided by anecdotal and best guess practices instead of data driven planning.



This research is being conducted as a required segment of the Executive Leadership component of the National Fire Academy's Executive Fire Officer Program (EFOP). The ideas being studied were pertinent to many different aspects of the Executive Leadership (EL) class. More specifically, the EL class teaches the requirement to recognize a call for change and then take the appropriate steps to implement those necessary changes. Furthermore, the EL class discusses the concepts of quality and the use of quality improvement models. Recognizing the need for change and then measuring the effectiveness of change necessitates the implementation of an accurate patient care reporting tool.

The implementation of an electronic patient care reporting system will require substantial changes within Howard County Fire and Rescue. The skills taught in the EL class regarding change management will be used to implement this new program within HCFR. Additionally, this Applied Research Project supports one of the USFA's operational objectives of appropriately responding in a timely manner to emerging issues.

### **Literature Review**

In October of 2001 the United State General Accounting Office (GAO) created a report as requested by several members of the United States Senate. This report included a summary line on the cover describing their findings "Reported Needs are Wide Ranging, With a Growing Focus on Lack of Data." The GAO report identified for recent unsuccessful attempts by federal agencies to collect EMS data. In the year 2000, less than one-fifth of the states reported that they had the ability to collect statewide EMS data. The lack of incentives at the local level was identified as a contributing factor to this lack of patient care information (General Accounting Office Report, p.6). This GAO report specifically addressed the correlation between patient care reporting and payment for services.

"Our work looking at this process also found problems with the adequacy of data reported on ambulance claims. Claims for reimbursement were being denied at varying rates across payers because providers were not completing forms correctly and because of gaps in information on the beneficiaries' health conditions linked to the appropriate level of service" (General Accounting Office Report, p.16).

This report went on to state that the evaluation of many EMS systems identified needs in staffing, training and equipment, and financing local EMS systems. These needs remain unmet in many systems as:

"Local EMS agencies and providers often lack data to justify budget requests, answer questions about patient outcomes, or support ongoing quality improvement and surveillance. All nine local and six state systems we consulted indicated that information and information systems were needed to monitor performance and to justify and quantify needs at the local level and for decision makers." (General Accounting Office Report, p.17).

The lack of data has been considered a major obstruction for monitoring national health priorities. Two goals have been established by the National Healthy People 2010 initiative involving response times. Lack of data has compromised the ability to achieve this goal. (General Accounting Office Report, p.17).

Mears, Ornato, and Dawson wrote that the need for good EMS data was necessary to establish an EMS system. This need was first realized and described in 1973 as one of the fifteen essential components of an EMS system. The authors went on to discuss how consistent data at the local level would improve reimbursement and provide accurate information that could be used to determine national fee schedules for EMS services. Additionally, they recognize that

the lack of accurate data has effected pre-hospital education, research and reimbursement. This report identified the need to design a patient care reporting tool that will work with the EMS system design and existing workflow. A failure to consider these factors will result in poor data and overall system failure. This article stated that the inadequate data has created a system that prevents EMS from being recognized as a profession. Additionally, it is not possible to gather information relating to the value of EMS providers as compared to the cost of services provided and the associated patient outcomes. This author stated that:

"EMS patient reporting and use must be based on the EMS system design and its workflow. Inadequate considerations of these two factors will result in incomplete data, useless information, and information system failure. Data definitions must be clear and understandable, collection must be as automated as possible, and the information system should have a positive effect on performance by improving patient treatment and care, and providing real-time feedback to the systems and providers. Many potentially good EMS patient care reporting systems have failed for lack of understanding and consideration of the end user and EMS workflow" (Mears 2002).

The National Highway Traffic Safety Administration (NHTSA) created the EMS Agenda for the Future to outline the most important directions for the future of EMS. One of the items identified is: "There currently is a lack of information regarding EMS systems and outcomes. Despite many years of experience, we continue to lack information regarding how EMS systems influence patient outcomes for most medical conditions, and how they affect the overall health of the communities they serve. Emergency medical services-related research usually has focused on one disease and operational issue, and often is conducted in only one EMS system. The

conclusions drawn may not be valid or applicable in other EMS systems" (NHTSA EMS Agenda for the Future, p.7)

The agenda for the future is a roadmap for the future development of EMS systems across the nation. This road map identified five major deterrents to quality EMS research:

- 1) Inadequate funding
- 2) Lack of integrated data systems
- 3) Lack of commitment by research institutions
- 4) Overly restrictive patient consent interpretations
- 5) Lack of support by EMS personnel

The need for more accurate EMS data is linked throughout the report to various items affecting the future of EMS systems (NHTSA EMS Agenda for the Future. P.13).

The November 2004 issue of the Journal of Emergency Medical Services (page 207) included an article describing a successful automated charting system. This article described challenges that had existed at San Diego Fire Department (SDFD) regarding data entry in the past. The SDFD had previously completed scantron bubble sheets to gather data. They had recognized that this form of manual data entry had led to inaccurate, illegible and incomplete records. As a result of this need SDFD, has evaluated different automated patient reporting systems and they realized that a system did not exist that would meet their needs. As such, they created their own system over a five year period at a cost of approximately \$500,000. SDFD had recognized many benefits to the automated patient care report. These benefits have included more accurate records completion, an increase in data quality and a significant decrease in the amount of time necessary to create patient bills. San Diego is the sixth largest City in the United

States responding to over 67,000 emergency medical responses per year (San Diego Fire Department web site).

In a phone interview with William Ott of CPCS Technologies, he described the challenges that have been faced by entities implementing ePCR. During this discussion, he described the numerous services that had failed because they didn't select a system that would be supported by field personnel. He stated that "field personnel support and buy-in will make or break the patient care reporting system." Additional concerns were voiced regarding selecting appropriate computer hardware. He has recently seen a significant number of systems removing laptop devices from vehicles and replacing them with desk top systems. A common concern included battery life, start up times and overall hardware survival in the mobile environment. Mr. Ott went on to discuss the need for entities to evaluate several options for ePCR systems and find the system that works best for their individual department. He stated that with the right expertise it would be possible for an agency to create their ePCR system. However, he also recognized that many small agencies do not have the expertise to create such a project.

In November of 1990 the Annals of Emergency Medicine published an article titled prehospital Data Entry Compliance by Paramedics after Institution of Comprehensive EMS Electronic Patient Care Reporting Tool (Spaite 1990). This publication discussed the implementation of a comprehensive ePCR tool in Tucson Arizona. The article found that initial compliance was very poor with a non compliance rate of approximately forty percent during the first month of implementation. The rate improved dramatically during the next two months with non-compliance rates at 4.4% and 5% respectively. The authors attempted to define the reasons for the dramatic increase in accuracy. They found two possible causes for the improvement. The first was an actual learning curve of the personnel. The second was a strong quality

assurance system that involved a review by the paramedic's immediate supervisors for compliance. Non-complaint charts were then returned to the paramedic for completion. A second review occurred at the level of the Tucson Fire Department Medical Director. It is difficult to understand if the improvements came as a result of the Quality Assurance or the learning curve. However, the article does outline that the combination of system education and experience combined with quality supervisory oversight eased the implementation of this ePCR system.

In 1999 Meislin, Spaite, Conroy, Detweler and Valenzuela completed a research project that was published in *Prehospital Emergency Care* (Meislin 1999). This project discussed developing an electronic patient care record that could be used on a portable computer actually installed in an EMS vehicle. They recognized that the need for reliable data has been well identified and discussed for many years. The authors reviewed the significant number of data variables that would be included in the electronic patient care record. After the software was developed they tested their system in several rural EMS agencies in Arizona. During this process they discovered several challenges to implementing an automated ePCR system. These limitation included cost, training and support of the field providers. Eventually, they found that for any system to improve patient care reporting, it must be acceptable to the end users.

Middleton described some items for consideration in establishing electronic medical record in the August 2002 EMS magazine (page 65). He described the correlation between collecting fees for service and timely completion of the billing process. Moreover, the article matched some of the same concerns that are currently seen in HCFR regarding the Quality Assurance process. Additionally, he described the electronic medical records as the first step in EMS organizations ability to perform effective quality improvement processes. He discussed

some things to consider when implementing the system. More specifically, he discussed the need to select an appropriate vendor and provide training to field personnel. He describes the software needs as "An electronic form with the flexibility to adapt to a system's ever-changing needs" (Middleton, 2002).

The July 2002 Issue of EMS Best Practices discussed the pursuit of an effective field ePCR system. The author described the attempts that had been made in a Minnesota EMS system to implement an electronic patient care reporting tool. It was identified that gaining support from the field providers would be an essential step in implementing the system. The implementation was successful after crews were trained and the program was customized to meet both organization and individual goals (Becknell, 2002).

On November 10 2008, Dr. Kevin Smith was interviewed regarding the recent implementation of an electronic medical record in the Emergency Services Department of Samaritan Healthcare. Dr. Smith explained some significant challenges that had occurred when the system was implemented. Included in those challenges were an increase in medication errors and an increased wait time for patients to be seen in the hospital. He felt that this system was not user friendly to the physicians who had now become "data entry clerks." The need for an electronic medical record was well supported by the group of physicians. However, they were not able to provide input into which system would be used in the emergency department. Instead, the facility had chosen a vendor that provides other software used by the facility. The physicians felt that they had a strong background in using computer applications and that they had received adequate training to operate the system. Dr. Smith believes that this implementation failed, and he is now in the process of reviewing and testing other systems that could be implemented into the emergency department.

On October 25, 2008 Hugh Forton was interviewed regarding his needs as the Quality Assurance clerk. Mr. Forton has been primarily responsible for data input, collation, and collection of MIR's for nine years. He is familiar with the different data points that are necessary for completing patient reports. Additionally, he has had significant experience using existing data gathering tools. Over the past few years, the increase in call volume has added an ongoing burden to his position and his level of efficiency is compromised by the inaccurate and illegible data provided by field providers. Mr. Forton feels strongly that an ePCR system must integrate with our existing quality assurance processes to provide for a seamless transition of data from the field to the QA point.

Dr. Kevin G. Seaman, HCFR's Medical Director, was interviewed on December 17, 2008. Dr. Seaman is responsible for quality of care provided by pre-hospital personnel throughout Howard County. He has served as a key player in the forming of the Maryland state medical protocols. One of HCFR's internal General Orders specifically addresses the completion of a medical incident report that is left at the receiving facility along with the patient. This protocol requires that the document be completed and left with the facility. In this discussion Dr. Seaman agreed with the need to implement an accurate ePCR system for HCFR. He stated that he would be supportive of electronic patient care report, including having providers complete these reports on desktop computer systems at their stations. These reports could then be faxed to the receiving facility allowing for necessary documentation of the patient's care.

On December 15, 2008 Assistant Chief Michael Macadams of Montgomery County (Md.) Fire and Rescue was interviewed regarding their field ePCR system. Chief Macadams has been actively involved in the implementation and coordination of the ePCR system in place for



Montgomery County. They respond to 164,000 calls per year and they have had great success with their program. He believes that their system is easily adapted to meet the changing needs and specific patient care reporting items as necessitated by different Quality Assurance or study items. Their software vendor had been able to create a program that would allow ePCR to be integrated into their existing records management and Computer-Aided Dispatch (CAD) software minimizing the workload of quality managers.

### **Procedures**

Action research was used throughout this project. This research method was used because the ultimate goal of this project is to create a plan for implementing an electronic patient care reporting system in HCFR. During the research, it was difficult to find any published work regarding methods used by other Departments to implement an ePCR system. Instead, references were plentiful regarding the need for accurate EMS data and issues to consider when implementing such a project. To complete this project I used literature review, personal interviews, and two survey instruments.

### **Literature Review**

Literature searches began at the National Emergency Training Center's (NETC) Learning Resource Center in July of 2008. The NETC library staff provided valuable assistance in searching for published documents regarding EMS reporting. Additional research was conducted through the Howard County Maryland Public Library and the Johns Hopkins University's library system. The internet provided extensive on-line searches and literature to evaluate other published literature that could be used for the project.

**Personal Interviews**

Personal interviews and direct correspondence occurred with experts in the areas of electronic patient care reporting. A phone interview was conducted with William Ott, President of CPCS Technologies. Mr. Ott has provided technology consulting for public safety industries since 1981. He recently authored articles related to field data collection in several trade journals.

Sandi Shadrick, EMS Operations admin clerk for HCFR, provided valuable information on the evolution of the patient reporting system. She has been intimately involved in the patient care reporting system used by HCFR.

Mr. Hugh Forton of HCFR was interviewed in August 2008. Mr. Forton is the QA clerk for HCFR. He has real-life knowledge of the current challenges regarding field patient care reporting and the inefficiencies of existing practices. Mr. Forton will be in the position of receiving data from HCFR's EMS providers, and then loading this information into the existing QA program.

Matthew Levi, MD, of Howard County General Hospital's emergency department, was interviewed in November of 2008. Dr. Levi had recently been involved in the implementation of an automated documentation system used by emergency department physicians. This implementation has been unsuccessful and Dr. Levi is now looking for other options.

Kevin G. Seaman, MD, Howard County's, Medical Director, was interviewed in December of 2008. Dr. Seaman is the HCFR Medical Director. He is ultimately responsible for authorizing and approving the patient care protocols used by HCFR. Dr. Seaman's input has been essential as he will be using this data to monitor the quality of care delivered by HCFR paramedics.

## Survey Instruments

HCFR's EMS care providers were involved in a product evaluation. During this evaluation, three leading ePCR software programs, Zoll, ESO Solutions and Liquid Office, were loaded as test versions on three separate computer systems. Each of these software systems was able to download data into the existing HCFR EMS QA system. The computer hardware had similar features and capabilities. HCFR providers were provided with a set of written instructions, as Evaluation Survey (Appendix A) and a written document that provided information on three common EMS responses. After the providers reviewed this material, they were given an opportunity to ask questions and clarify any items before beginning the ePCR entry. They then completed an electronic patient care report for three medical incident responses. Each provider completed this process on each of the software programs. Upon completion of the evaluation, each provider was advised not discuss the results with others until the evaluation had been completed. These surveys were then compared to look for trends or patterns of similarities involved with the product evaluation. A total of 110 paramedics participated in this evaluation (100% of HCFR paramedics).

The results from this Evaluation Survey provided information to the Department regarding the paramedics' assessment of the various systems available. The majority of the paramedics (72) felt that the product by ESO Solutions best met their needs for data input. The survey demonstrated that the paramedics who used this software were able to decrease input times from an average of 20 minutes to 11 minutes over the course of entering three medical records.

The software vendor that had been selected by the evaluation survey was then contact for a list of references and current users of the program. This vendor provided HCFR with contact

information to survey the users of their product. A survey was created (Appendix B) and sent to each of these users to determine the methods they had used to move the ePCR into and operational role. During the survey development stage, the Information Technology manager for HCFR reviewed the questions relating to operating hardware to gather necessary information for the actual future purchases of the necessary computer hardware. This survey was then sent out to software users. A total of twenty surveys were submitted to various users of the software. Fifteen of these surveys were returned. These users completed the survey and returned it to the researcher at HCFR. Upon receipt, of these surveys the results were evaluated to determine some key factors that could be used by HCFR for implementing an electronic patient care reporting system. Specific factors included the following:

- 1) Do your providers gather electronic signatures?

Of the 15 responders to the survey, only 4 completed electronic signatures. Reasons for not collecting the signatures included cost of hardware, difficulty in using laptop computer during the actual response, and time constraints with completing the electronic record to gain refusal of treatment signatures.

- 2) Do you leave a completed electronic record at the hospital and leave a copy of the document with the patient?

The majority of respondents (9) do not leave a copy of the record at the hospital.

Instead, they completed the records at their station for another call. These records are then transmitted to the hospital via fax modem.

- 3) What methods of training did you use for both program implementation and ongoing new employee training?

The respondents had overwhelmed used on site training from the vendor for supervisory and training personnel. End users then received training from the supervisors and training staff. Fourteen of the 15 respondents felt that this method met their needs and they were able to successfully implement and use the ePCR system.

The majority of respondents did not gather signatures or leave records at the hospital. As such, they may not have needed to use laptop devices. The use of desk top devices would minimize the out of station and service area times for HCFR, while allowing data to be collected and transmitted to both the QA clerk and the hospital. Additionally, the vendor training received by Department training personnel appears to be the successful baseline for personnel training. The ongoing education of HCFR personnel can then be efficiently implemented by the HCFR Training staff.

### **Limitations**

Electronic patient care reporting had been long recognized as a necessary part of EMS system development. However, actual implementation of ePCR systems has been slow to progress. As such, the number of systems in place is fairly minimal. Additionally, it was felt by the researcher that HCFR providers needed to provide significant input into the type of system implemented by their department. HCFR employs a relatively small number of EMS providers at the ALS level. These paramedics provided input based solely upon their perceived needs in the HCFR EMS delivery system. The application of these findings may be of great value to similar organizations. However, the process of having 100% of the department's paramedics enter multiple reports on different software systems may prove to be time prohibitive for larger organizations.

The various ePCR software vendors have largely different capabilities. These differing capabilities make it difficult to compare systems as they are not created to meet any set standards. This research used the need to merge data into the HCFR records management and CAD systems as a primary standard for inclusion into HCFR product evaluation.

## **Results**

What ePCR system will meet the needs of HCFR EMS providers and Quality managers?

The research conducted regarding the product evaluation strongly indicated that the system designed by ESO Solutions was found to be superior to that of the other vendors. This system did not meet the requirements of being able to download information into HCFR records management and CAD systems.

What would be the benefits of an ePCR system?

The need for ePCR has been well demonstrated as a systems issue. The actual benefits to HCFR include both a contribution to the overall knowledge of emergency services and the need to improve the EMS QA processes within the department. These internal process improvements would include an increase overall efficiency and would be a basis to make quality improvements for EMS operations.

What should be considered when implementing an electronic Patient Care Reporting system?

The quality of data input will be the essential success factor of the ePCR system implemented by HCFR. HCFR personnel will need to be able to enter data in a timely and accurate manner allowing for an exchange of data from the medical record to the QA system. Additional considerations will include the training of personnel to make certain that they are able to input data in the most efficient means possible. The information gained in personal interviews combined with the data collected from the surveys will provide the basis for this initial training.

The various types of hardware that can be used to operate the software are a necessary consideration into the implementation of the ePCR system. Laptop devices are commonly used for these applications. However, the need for laptop systems may be less valuable to HCFR as their paramedic units are able to return to stations after calls and complete records on desktop systems.

What would be for the plan for implementing an ePCR system? The plan for implementing the ePCR system includes several steps:

- 1) Identify the need for an electronic Patient Care Reporting system.
- 2) Budget appropriate funds for implementing an ePCR system.
- 3) Investigating the various capabilities of available software systems and determining their compatibility with existing records management and CAD systems.
- 4) Having HCFR personnel evaluate the available systems and make recommendations on software purchase.
- 5) Coordinate with the HCFR Information Technology department to purchase appropriate hardware and identified software for use by HCFR.
- 6) Schedule on-site training.
- 7) Coordinate the installation of software and test the connection of software systems for both ePCR and existing records management and CAD systems.
- 8) Rotate personnel through mock field ePCR scenarios while providing continued training.
- 9) Implement the ePCR system.
- 10) Ongoing review, evaluation, and feedback to the field providers, HCFR management, and the product vendor.

## **Discussion**

The implementation of an ePCR system into fire departments across the nation has not been significantly studied. Many groups have identified the need for better data to guide the future of pre-hospital medical care. However, fire departments have not yet taken the necessary steps to implement this type of patient care reporting system. Interestingly, fire departments have been in the forefront of data gathering in the items related to Fire Protection. This has provided a large success to the fire prevention programs in most communities. This success has allowed many departments to begin providing emergency medical services. Eighty percent of the responses made by HCFR are for emergency medical conditions (Howard County Annual report 2008). This overwhelming percentage of responses is not unlike many of today's fire departments in the United States. The integration of EMS into fire departments is becoming much more common. However, the valuable lessons learned from gathering fire data has yet to be implemented into medical responses. This could be largely attributed to the relative youth of fire-based emergency medical services in general.

The need for this data has been well documented and specifically referenced by the October 2001 GAO report and the NHTSA Emergency Medical Services Agenda for the Future. Additional needs have been documented by both public and private agencies. This lack of data has compromised the system's ability to document what happens today and what needs to happen in the future. The Howard County Fire and Rescue has been on the forefront of identifying this need in the region and taking the steps necessary to implement an adequate system. Each step of this study has included necessary information to format a plan for implementation of an ePCR system.



The literature review provided the researcher with adequate information to define the need for introducing an ePCR system. This review included many documents that defined data needs currently not being met. Additionally, this review focused on how the lack of data has compromised the ability of systems to project future financial needs. It has also compromised the ability of systems to evaluate the quality of care being delivered in systems today as compared to systems in place 10 or 20 years ago. Data is only collected as required by state agencies that have struggled with implementing a mandated data management system. These struggles have been well documented in the State of Maryland. Allowing the end users to have control over their destiny will provide a much greater opportunity for support and success of the system. HCFR EMS providers who evaluated the system were able to provide input to determine which system would meet their needs the most adequately. The review by the QA clerk provided the necessary information to understand that the system would be compatible with records management and CAD systems. Additionally, this review had provided HCFR EMS providers with an understanding that the changes are coming and that they have had input into these changes. The simulated ePCR has provided them with a very minimal amount of experience on the systems. However, it has provided them with a great amount of knowledge regarding the need for training on system usage. The interview with Mr. Ott provided valuable information on the status of EMS reporting as it exists today and as it has developed over the last few years. Interestingly, Mr. Ott identified the need to have the support of field personnel to have a successful EMS data entry tool. He answered valuable questions regarding the ability of most systems to gather data and then export that data to the various records management and CAD systems.

Two surveys were conducted during this process. The first survey was conducted with the assistance of HCFR EMS providers. As discussed in the procedures section. These providers had the opportunity to actually use the software on three simulated medical responses. The EMS providers completed documentation on these calls with information similar to that they would gather on the actual EMS call. As the providers field-tested these options, it became apparent that one software vendor was preferred over the other two. These results were then used to contact agencies that currently use this software vendor. These agencies then completed another survey that provided information regarding the methods they used to place the ePCR system in use within their department. These agencies also provided significant information regarding the hardware to be used and the success with various methods of training. This information was then used to formulate a plan for HCFR to implement an appropriate system into their department. This project has provided HCFR with a roadmap for implementing a program. This roadmap will significantly improve the early success of the program while setting the groundwork for a sustainable ePCR system.

### **Recommendations**

The research regarding ePCR has lead the researcher to better understand the true need for ePCR and the void that currently exists within HCFR. The original needs identified by HCFR were strongly slanted towards improving the QA system and secondarily towards gathering accurate data for future growth. The research has helped to identify the needs for HCFR to take step to become an advocate for accurate for patient care reporting. The benefits to the ePCR will not only improve the quality of care delivered in Howard County, but it will also improve the services rendered throughout the region. Based upon this research, it is recommend that:

- 1) HCFR should move forward with implementation of ePCR system. The implementation of this program will continue to include the direct involvement of the end-users. The success of this program will provide HCFR with data that can be used to help improve the quality of services provided to our community.
- 2) HCFR should seek out and find other entities actively involved in ePCR to continually improve the department's ePCR system.
- 3) HCFR should actively advocate for ePCR for other EMS systems. The need has been well documented and the future of EMS will be driven by the data that can be collected.

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**Appendix A**

**SURVEY OF HCFR PERSONNEL:**

**ePCR SYSTEM**

1. Have you completed the entry of three simulated responses on the computer labeled test A?

\_\_\_\_\_Yes\_\_\_\_\_No

2. If yes, how long did it take for you to complete the data entry for each simulated response?

Response 1   Response 2   Response 3

\_\_\_\_\_Minutes\_\_\_\_\_Minutes\_\_\_\_\_Minutes

3. Did this data entry system allow you to complete reports in adequate detail?

\_\_\_\_\_Yes\_\_\_\_\_No

Comments:

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4. Where the data entry fields set up in a manner adequate for your documentation style?

\_\_\_\_\_Yes\_\_\_\_\_No

Comments:

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5. Please rate this data system below (circle one)

Excellent Good Adequate Fair Poor

Comments:

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6. Do you have a personal computer?

\_\_\_\_\_Yes\_\_\_\_\_No

7. Please rate your perceived level of 'computer knowledge' below: (circle one)

Comprehensive knowledge (Able to install software and operate most systems)

Significant (Able to operate software and perform minor troubleshooting)

Operational (Able to use software with minimal assistance)

Minimal (Struggle to use basic computer systems)

8. Comments:

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Survey Completed By:\_\_\_\_\_Date:\_\_\_\_\_

## **Appendix B**

### **ePCR Survey**

1. Does your organization currently use an automated ePCR system for documenting Pre-hospital emergency medical care? Y or No; If No, please skip to Section II.
2. Does this system merge data with your billing software? Y or No; If yes, what billing software do you use?  

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3. Have you measured the time spent completing a medical record by hand? Y or N; If so, how long did it take to complete a record by hand? \_\_\_\_\_Minutes
4. Have you measured the time spent completing a medical record with an automated system? Y or N; If so, how long does it take to complete a record with the automated system?
5. Do your personnel complete the majority of their medical records at the receiving hospital? Y or N; if yes, please skip to #7.
6. Do your personnel complete the majority of the records at the station? Y or N
7. Have you attempted to complete the records at the receiving hospital? Y or N; If No please skip to #9.
8. Was this successful? Y or N; If not, why?  

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9. If you complete the records on a laptop computer, what make and model of equipment did you use? (Example: Panasonic Touch Books etc.)



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10. How long do you expect the computer equipment to last before needing an upgrade?

(Please select one)

\_\_\_ 1-3 years

\_\_\_ 3-5 years

\_\_\_ 5-7 years

\_\_\_ 7 + years

11. Are you satisfied with the equipment's performance in the following areas:

(Please circle)

Speed of start up Y N

Reliability Y N

Battery Life Y N

Ease of Use Y N

Durability Y N

Wireless Connectivity Y N

If you answered 'No' to any of the above please explain:

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12. Do you have your EMS patients sign the following forms as applicable?

Against Medical Advice and/or Refusal of Care Y N

Authorized and consent for billing Y N

HIPPA privacy Act Notification Y N

13. How do patients sign these forms? (Please select the one that fits the majority of your EMS responses)

\_\_\_\_ Separate written document

\_\_\_\_ Signature on automated system (computer screen or touch pad)

\_\_\_\_ Other (Please describe

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Are you satisfied with this method of gathering signatures? Y or No

14. Do you leave a copy of the medical record at the receiving facility? Y or N

15. How do you print the document? (circle one)

\_\_\_\_ Printer at the hospital

\_\_\_\_ Portable Printer

\_\_\_\_ Fax via Modem

\_\_\_\_ Other (please explain)

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16. When you started the automated ePCR system, did you receive onsite Training from the software vendor? Y or N; If No, skip to #21

17. Who attended this training? (Select all that apply)

\_\_\_\_ Training Officers

\_\_\_\_ Management

\_\_\_\_ Prehospital personnel (field Paramedics/EMTs)

\_\_\_\_ Quality managers (please mark MA if your agency does not have quality managers)

18. How long did this training last? \_\_\_\_ Hours

19. Was this training adequate to implement the ePCR software? Y or N

20. How did you initially train EMS personnel? (Check all that apply)

\_\_\_\_ On the job training with a preceptor.

\_\_\_\_ Formal training program taught by department personnel.

\_\_\_\_ Online training through vendor.

\_\_\_\_ Formal in-person training through vendor

\_\_\_\_ Other; Please describe

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Please indicate the number of hours as applicable:

Dept. Training	Online Training	Vendor Training	Other
Hrs:	Hrs:	Hrs:	Hrs:

21. Was this training adequate to implement the ePCR software? Y or N

22. How do you train new personnel? (Check all that apply)

\_\_\_\_ On the job training with a preceptor.

\_\_\_\_ Formal training program taught by department personnel.

\_\_\_\_ Online training through vendor.

\_\_\_\_ Formal training in-person via vendor

\_\_\_\_ Other please describe

---

Please indicate the number of hours as applicable.

Dept. Training	Online Training	Vendor Training	Other
Hrs:	Hrs:	Hrs:	Hrs:

23. Is this training adequate for personnel to begin using the ePCR software? Y or N

24. Have you seen a change in EMS documentation? Y or N (If No, Go to #27)

25. Have you measured the change? Y or N (If Yes, what has been the Change?)

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26. Has the ePCR process decreased the workload of Quality Managers? Y or N (If Yes, have you measured the decrease? Y or N. If yes, how much has it decreased?)

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27. Please describe any additional information that you think would be valuable to a Fire-based EMS department implanting ePCR (attach additional sheets as necessary).

Name and Phone number of person completing this survey.

Name: \_\_\_\_\_ Phone Number: \_\_\_\_\_

Thank you for your time in completing this survey. Please return the survey to me in the enclosed envelope. A copy of the results will be sent to you when they have been complied. For a copy of the completed research paper please contact me at the following location: *Deputy Chief John S. Butler MS, NREMTP Howard County Fire and Rescue*

*6751 Columbia Gateway Drive #400, Columbia, Md. 21046*

*[jbutler@howardcountymd.gov](mailto:jbutler@howardcountymd.gov), 410.313.6025, Fax: 410.313.6099*

## Appendix C

### Plan for Implementation of ePCR System in Howard County Fire and Rescue

1. *Identifying the need for an electronic patient care reporting system.*

Howard County Fire and Rescue has experienced an increase in the number of EMS responses over the last three years. During this time, HCFR has not increased the amount of staff necessary to complete the patient data QA process. This, combined with the need to improve accuracy of the data collected has brought the need for an ePCR system to the forefront of HCFR EMS 2009 strategic goals.

2. *Budget appropriate funds for implementing an ePCR system.*

The HCFR budget is completed in August of each year. An appropriate amount of funding was placed in the budget to implement an electronic patient care reporting system. This budget was approved by the Howard County Council in November 2007.

3. *Investigating the various capabilities of available software systems and determining their compatibility with existing records management and CAD systems.*

This research project was used as a primary tool towards the evaluation of various ePCR systems. The budget process, combined with the need to maintain existing records management and CAD systems limited the number of vendors that would be considered. It is important to note that the existing records management and CAD systems are widely used throughout the United States and that these limitations did not handicap the project.

4. *HCFR personnel to evaluate the available systems and make recommendations on software purchase.* The surveys, as referenced in this research project, will be used to make an appropriate purchasing decision. This process will give the end-users a

significant amount of input regarding the type of system to be purchased by HCFR. In turn, this will begin the process of gathering support for the ePCR system.

5. *Coordinate with the department's Technology and Communications section to purchase appropriate hardware and identified software for use by HCFR.* The Technology and Communications section will make the purchase of the software and coordinate the installation and networking of the ePCR system. The section will also be responsible for the ongoing hardware support and replacement.
6. *Schedule on-site training.* The software vendor will come to Howard County, Maryland to provide actual training of a select group of HCFR personnel (train-the-trainers) who will then conduct training and orientation for other EMS providers. Prior to the arrival of the software vendor, this group of trainers will have the opportunity to use trial versions of the ePCR software. This use of trial versions will allow the trainers to develop a functional understanding and familiarity with the software. These personnel will then be able to maximize the resources of on-site vendor personnel.
7. *Coordinate the installation of software and test the connection of software systems for both ePCR and existing records management and CAD systems during the training sessions* vendor personnel will be present at HCFR. At this time they will be installing the permanent version of the ePCR system. This system will be installed on desktop computers at each station and on laptops and desktop computers used by the MDO's. These systems will be tested by both Tech/Comm. section and HCFR personnel to assure that they are functional and communicating data in a manner necessary to minimize duplicate data input by the QA Clerk.

8. *Rotate personnel through mock ePCR scenarios.* After the group of HCFR personnel has received the training from the vendor, they will begin training other department personnel. This training will occur on an individual basis between the field provider and the trainer. The software vendor will provide technical and training support via telephone during this time. A list of vendor contact questions will be maintained by the Deputy Chief of EMS. This list will be made available to all personnel so that they can learn from the questions of others. Personnel will continue to receive this training until they are able to demonstrate a level of competency necessary to complete the ePCR.
9. *Implement the field ePCR system.* The field ePCR system will be implemented after all personnel have had the opportunity to train with HCFR trainers. This day of implementation will be described as the "Go Live" day of the ePCR system.
10. *Ongoing review, evaluation, and feedback.* The quality managers and the QA clerk will continually monitor the quality of data submitted by personnel. Additional training and reviews will be ongoing. Department personnel will have the opportunity to make suggestions for changes in the ePCR system on an ongoing basis. These suggestions will be evaluated by the Deputy Chief of EMS and forwarded to the software vendor as appropriate for system changes.

#### **Timeline for Implementation**

- 1) *Identifying the need for an electronic Patient Care Reporting system*

Status: Complete June 2008

- 2) *Budget appropriate funds for implementing ePCR.*

Status: Complete August 2008

- 3) *Investigating the various capabilities of available software systems and determining their compatibility with existing records management and CAD software.*

Status: Complete

- 4) *HCFR personnel evaluate the available systems and make recommendations on software purchase.*

Status: Complete

- 5) *Coordinate with the HCFR Technology and Communications section to purchase appropriate hardware and identified software for use by HCFR.*

Status: Currently in progress.

- 6) *Schedule on-site training.*

Status: Will be coordinated with software vendor to occur on April 6-8, 2009

HCFR training personnel will begin using trial versions on March 23, 2009

- 7) *Coordinate the installation of software and test the connection of software systems for both ePCR and existing records management and CAD systems.*

Status: Will occur during the software training times on April 6-8, 2009.

- 8) *Rotate personnel through mock ePCR scenarios while providing continued training.*

Status: Scheduled to occur from April 8-13, 2009

- 9) *Implement the ePCR system.*

Status: Scheduled as follows

April 20 B Shift

April 21 C Shift

April 22 A Shift

- 10) *Review, evaluate, and feedback. Ongoing.*